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WE CLAIM:

1. A method of avoiding the generation of Mach waves from an operating jet engine, said method comprising the steps of:

(a) intaking air into a first end of a jet engine;

(b) heating a first stream of said air to a first temperature; accelerating said first stream of said air to supersonic speeds and expelling said first stream out a second end of said jet engine;

(c) heating a second stream of said air to a calculated second temperature;

(d) maintaining the velocity of, accelerating or decelerating said second stream of air to a predetermined air velocity;

(e) expelling said second stream out said second end of said jet engine at a position adjacent to said first stream of air such that there is no gap between said first stream and said second stream; and

(f) assuring that a speed and temperature of said second stream satisfy the following conditions:

the difference in air velocities between said first stream of air and said second stream is less than the speed of sound in said second stream; and

the difference in air velocity between said second stream and air flow surrounding said second stream is less than the speed of sound in said air flow;

the temperature of the second stream is greater than:

$$(B * M_1 / (1 + M_2))^2 * T_1;$$

and the temperature of said second stream is less than:

$$T_a * ((1 + M_a) / (B * M_2))^2;$$

where M_1 = air velocity of said first stream divided by a first speed of sound in said first stream;

M_2 = air velocity of said second stream divided by a second speed of sound in said second stream;

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on said first side and a second stream of heated air exits said exhaust end on said second side;

a combustion chamber for heating adapted to heat said first stream such that said first stream is expelled from said exhaust end of said jet engine to produce a first thrust; and

a heating mechanism adapted to heat said second stream to a temperature different from that of said first stream such that said second stream is also expelled from said exhaust end of said jet engine to produce a second thrust adjacent to said first thrust and thereby prevent Mach waves from said first thrust.

20. The jet engine of Claim 19, wherein said first and second stream pass through said combustion chamber before said partition separates said first stream from said second stream; after said separation, said heating mechanism designed to further heat said second stream.

21. The jet engine of Claim 19 wherein said jet engine is a turbojet engine.

22. The jet engine of Claim 19 wherein said jet engine is a turbofan engine.

23. The jet engine of Claim 19, wherein said heating mechanism is a suppression burner, said suppression burner being designed to heat the air by burning a fuel.

24. The jet engine of Claim 19, wherein said heating mechanism is a variable compression ratio fan which can change its compression ratio and produce heat.

25. The jet engine of Claim 19, wherein said partition is an inner shell core of a jet engine.

26. The jet engine of Claim 19, wherein said partition further has louvers or apertures which can be opened to allow mixing of said first and said second stream.

~~27~~. 9 The jet engine of Claim ~~19~~ 1, wherein said jet engine is at least partially surrounded by a shroud, said shroud forming a confining wall for said second stream.

~~28~~. 10 The jet engine of Claim ~~19~~ 1, wherein said heating mechanism is a divider which diverts said first stream to entirely form or to mix with said second stream.

~~29~~. 11 The jet engine of Claim ~~28~~ 10, wherein said jet engine has a second divider which further divides said second stream from a third stream; and

a heating mechanism adapted to heat said third stream to a temperature different from that of said second stream, such that said third stream is also expelled from said exhaust end of said jet engine to produce a third thrust adjacent to said second thrust and thereby prevent Mach waves from said second thrust.

~~30~~. 12 The jet engine of Claim ~~19~~ 1, wherein said first stream has a circular ~~or elliptical~~ cross section at a plane, said plane located at said exhaust end of said jet engine.

~~31~~. 13 The jet engine of Claim ~~19~~ 1, wherein said first stream has a rectangular cross section at a plane located at said exhaust end of said jet engine.

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M_a – air velocity of ambient, unheated air surrounding said second stream, divided by ambient speed of sound;

T_1 – temperature of air in said first stream;

T_a – temperature of ambient, unheated air surrounding said second stream; and

B – eddy velocity / stream velocity; wherein B may range between 0.5 and 0.95.

2. The method of Claim 1, wherein step (c) comprises burning of fuel.

3. The method of Claim 1, wherein step (c) comprises mixing said first stream with said second stream.

4. The method of Claim 1, wherein step (c) comprises changing a compression ratio of a fan.

5. The method of Claim 1, wherein at a cross-sectional plane of said second end of said jet engine, said second stream is formed to completely surround said first stream.

6. The method of Claim 1, wherein at a cross-sectional plane of said second end of said jet engine, said second stream is formed to partially surround said first stream.

7. The method of Claim 1, wherein step (d) comprises changing a fan speed.

8. The method of Claim 1, wherein step (d) comprises changing the relative size of a second stream exhaust relative to a second stream intake.

9. The method of Claim 1, wherein step (d) comprises changing a mixing rate of said second stream with said first stream.

10. The method of Claim 1, additionally comprising heating a third stream adjacent to said second stream.

11. The method of Claim 1, wherein said second stream comprises a gas other than air.

12. A method of avoiding the generation of Mach waves from a jet engine operating in ambient air, said method comprising the steps of:

(a) intaking air into one end of a jet engine;

(b) heating a first stream of air to a first temperature and accelerating said first stream of air to a first air velocity exceeding the speed of sound in said ambient air and expelling said first stream out a second end of said jet engine;

(c) heating a second stream of air to a calculated second temperature and maintaining, accelerating or decelerating said second stream to a calculated second air velocity, wherein said second air velocity is less than or equal to that of said first air velocity;

(d) heating a third stream of air to a calculated third temperature and maintaining, accelerating or decelerating said third stream to a calculated third velocity, wherein said third air velocity is less than or equal to that of said second air velocity;

(e) expelling said second stream out said second end of said jet engine in a first position adjacent to said first stream of air; and

(f) expelling said third stream of air out said second end of said jet engine in a second position adjacent to said first position.

13. The method of Claim 12, wherein said second temperature satisfies the following conditions:

the temperature of the second stream is greater than:

$$(B_1 * M_1 / (1 + M_2))^2 * T_1;$$

and the temperature of said second stream is less than:

$$T_a * ((1 + M_3) / (B_2 * M_2))^2 * ((1 + Ma) / (B_3 * M_3))^2;$$

where

M_3 – air velocity of said third stream divided by a third speed of sound in said third stream;

M_2 – air velocity of said second stream divided by a second speed of sound is said second stream;

M_1 – air velocity of said first stream divided by a first speed of sound in said first stream;

M_a – air velocity of ambient, unheated air surrounding said second stream;

T_3 – temperature of air in said third stream;

T_2 – temperature of air in said second stream;

T_1 – temperature of air in said first stream;

T_a – temperature of ambient, unheated air surrounding said third stream;

B_3 – ratio of eddy velocity to stream velocity in said third stream, ranging in value from 0.5 to 0.9;

B_2 – ratio of eddy velocity to stream velocity in said second stream, ranging in value from 0.7 to 0.9; and

B_1 – ratio of eddy velocity to stream velocity in said first stream, ranging in value from 0.7 to 0.9.

14. The method of Claim 12, wherein said third temperature satisfies the following conditions:

the temperature of said third stream is greater than:

$$(B_2 * M_2 / (1 + M_3))^2 * (B_1 * M_1 / (1 + M_2))^2 * T_1;$$

and the temperature of said second stream is less than:

$$T_a * ((1 + M_a) / (B_3 * M_3))^2 ;$$

15. The method of Claim 12, additionally comprising heating one or more additional streams adjacent to the third stream.

16. The method of Claim 15, wherein there are four streams.

17. The method of Claim 12, wherein said third stream is at least partially heated using suppression burners.

18. The method of Claim 12, wherein the heating of said third stream is at least partially accomplished by mixing said third stream with said first stream of air or said second stream of air.

19. A jet engine which produces a supersonic stream of air, said engine comprising:

an air intake end and an exhaust end;

said exhaust end having a partition that divides said exhaust end into a first side and a second side such that a first stream exits said exhaust end

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